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ABSTRACT

A technique for assessing the agreement between the Q-sorts of two or more groups of subjects is presented which relies on the relationship between the Kendall coefficient of concordance (W) and the Spearman rank order correlation (rho). The proposed statistical treatment of Q-sort data involves the use of a number of intercorrelations rather than a direct computation of W. This method provides insight into the level and nature of the intra-group agreement and permits the use of certain readily available computer programs. (Author/HV)

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THE EXAMINATION OF INTRA-GROUP AGREEMENT OF Q-SORT RESPONSES

The Q-sort technique was developed in the 1930's by Stephenson and Thomson. A comprehensive analysis of the technique was first published in the 1950's (Stephenson, 1953). The Q-sort technique is essentially, a card-sort method for ordering statements, objects or adjectives by rank. This technique has been successfully used in education (Schill, 1961), psychology (Block, 1961) and communications (Emmert and Brooks, 1970). Redburn (1975) indicated the advantages of this method in comparison to normative measures and movement of subjects relative to a priori scales.

Many of the studies to date have examined the responses of two or more selected subjects. However, the experimenter may be interested in a comparison of the Q-sorts of two or more groups of subjects. The assessment of differences between groups (intra-group measurement) has been an elusive entity. The focus of this discussion is the use of the Q-technique as an intra-group measure.

Data from a curriculum study (Behm, 1975) are used herein as an example of the statistical procedures discussed. The data include responses from five faculty at each of six associate-degree nursing (ADN) programs and ten head nurses from each of six hospitals associated with these training programs. After the relative effectiveness of each ADN program was assessed by mailed questionnaire, the subjects performed a forced Q-sort of sixty nursing functions. The purpose of the Q-sort was to determine the agreement between ADN faculty and head nurses relative to the training that nurses should receive. The results of the study supported the hypothesis that the faculty of the more effective programs would display closer agreement with the head nurses on the Q-sort than would the faculty of programs perceived to be less effective. Those interested

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in a detailed discussion of these results are referred to the curriculum study.

Typical Q-Sort Analysis

Q-correlations, rank correlations across respondents, factor analysis which identify respondent loadings and item loadings are often used to analyze Q-sort data. The coefficient of concordance (W) is also used to analyze these data. W is commonly used to determine the agreement among several sets of rankings (i.e. within or inter-group agreement). The relationship between W and the Spearman rank correlation (ρ) permits the use of W as an intra-group measure.

The Relationship Between Spearman Rank Order Correlations and The Coefficient of Concordance

The coefficient of concordance measures the commonality of judgment for "m" observers. The Spearman rank order correlation coefficient , a special case of the Pearson product moment correlation, is a generally accepted method of determining the relationship between sets of rankings such as Q-sort data. Both computations require a correction for tied ranks.

The average Spearman rank order correlation bears a linear relationship to the coefficient of concordance (Kendall, 1962, p. 95).

$$\rho_{ave} = \frac{mW-1}{m-1}. \qquad \text{Transposing, } W = \frac{\rho_{ave}\, m - \rho_{ave} + 1}{m}.$$

It is this linear relationship between ρ and W which permits the inter- and intra-group analysis of Q-sort data which this paper describes. An advantage of using ρ for computing W, that needs to be mentioned here, is that computer programs such as the Statistical Package for Social Sciences (SPSS) include rank order correlations, but not the coefficient of concordance.

Inter- and Intra-group Agreement

The data from Behm's study (mentioned earlier) yielded three correlation matrices. One matrix, instructors, was 5 x 5 with ten intercorrelations, another, nurses, was 10 x 10 with 45 intercorrelations, and the combined 15 x 15 matrix with 105 intercorrelations. The average correlation within the instructor matrix can be used to compute W and yield a measure of the agreement among the instructors. The nurse matrix can be used in the same way to yield a measure of their inter-group agreement. However, the combined matrix cannot be used to assess the agreement between the groups since more than half of the inter-correlations represent inter-group agreement (see Figure 1).

(INSERT FIGURE 1 ABOUT HERE)

The inter-group agreement was computed for each of the sets of data by using a direct computational formula (Siegel, 1956, p. 231) and by using the average of the rank correlations. A comparison of the results of these computations indicated that ρ proved to be a more conservative method and that the small discrepancies between the two methods increase as W increases. The small discrepancies result, in part, from the different treatment of ties in the coefficient of concordance and the Spearman rank order correlation. This comparison indicated that W could be accurately calculated for the curriculum study Q-sort data by either ρ or a direct computational formula.

Given that W can be accurately calculated from ρ, it follows that the intra-group agreement can be calculated from the residual intercorrelations (the rectangular area in Figure 1). In our example the residual section which includes 50 pairs of faculty and head nurses was indicative of this agreement. A rank order correlation was calculated for each nurse-faculty combination (50 for each program). The average of these correlations was used to calculate a residual coefficient of concordance (W_R) for the agreement between the nurses and faculty members.

Intra-group W's were also calculated using the average of the 105 correlations in the sample space. This procedure would produce results equivalent to those produced by a direct computational formula. These results indicated different levels of agreement than those shown by the W's. For example, Program 1 and Program 2 displayed nearly identical levels of agreement based on the standard calculations (see Figure 2; $W_1 = .46$, $W_2 = .45$).

(INSERT FIGURE 2 ABOUT HERE)

However, the W_R's which resulted from the ρ_{ave} of the rectangular sample space indicated that Program 2 was in greater accord with its practice setting than was Program 1 ($W_{R_1} = .382$, $W_{R_2} = .512$). In this instance, the levels of agreement between the faculty members and head nurses were obscured by the inter-group agreements. In Program 1 the faculty members and nurses displayed a high level of agreement among themselves but displayed a low level of agreement between the groups. The faculty and head nurses associated with Program 2 showed a lower level of inter-group agreement but a higher degree of intra-group agreement. Some programs displayed equal levels of inter- and intra-group agreement. In these instances, the two methods yielded equivalent results. However, the analysis of the curriculum study data and other sample data demonstrated the importance of focusing upon the residual agreement (W_R) when the intent of the research is to examine the agreement between groups of subjects performing a Q-sort.

Conclusion

The purpose of this article has been to present a technique for assessing both inter- and intra-group agreement of Q-sort responses. The technique

relies on the relationship between the average Spearman rank order correlation ρ_{ave} and the coefficient of concordance W. The use of ρ_{ave} permits the examination of the agreement between groups of subjects performing a Q-sort. The direct computational method for W tends to obscure the level of intra-group agreement.

In addition to providing an accurate assessment of intra-group agreement, the use of ρ_{ave} permits the researcher to utilize computer programs such as the Statistical Package of Social Sciences (SPSS) and to test the significance of the different levels of agreement by treating each inter-correlation as a score (ie. without regard to the distribution of the correlation coefficients) (Block, 1964).

In summation, whenever the examination of the agreement between groups of subjects performing a Q-sort is of interest, the average of the inter-correlations should be used instead of the standard coefficient of concordance. This recommended treatment of the data can reveal a more accurate intra-group assessment than the traditional methods of analysis.

References

Behm, R. "An Examination of the Relationship Between the Effectiveness of Selected Community College Occupational Programs and Effective Communication." Dissertation (Ph.D.), University of Washington, 1975.

Block, J.A. "The Q-Sort Method in Personality Assessment and Psychiatric Research." Springfield, Illinois: Charles C. Thomas, 1961.

Emmert, P., & Brooks, W. "Methods of Research in Communication." Boston: Houghton Mifflin, 1970.

Kendall, M.G. "Rank Correlation Methods." New York: Hofner Publishing Co., 1962.

Redburn, F.S. "Q Factor Analysis: Applications to Educational Testing and Program Evaluation." Educational and Psychological Measurement, 1975, 35, 767-778.

Schill, W.J. "The Use of the Q-Technique in Determining Curriculum Content." California Journal of Educational Research, 1961, 12 174-184.

Siegel, S. "Nonparametric Statistics for the Behavioral Sciences." New York: McGraw-Hill Book Co., 1956.

Stephenson, W. "The Study of Behavior." Chicago: University of Chicago Press, 1953.

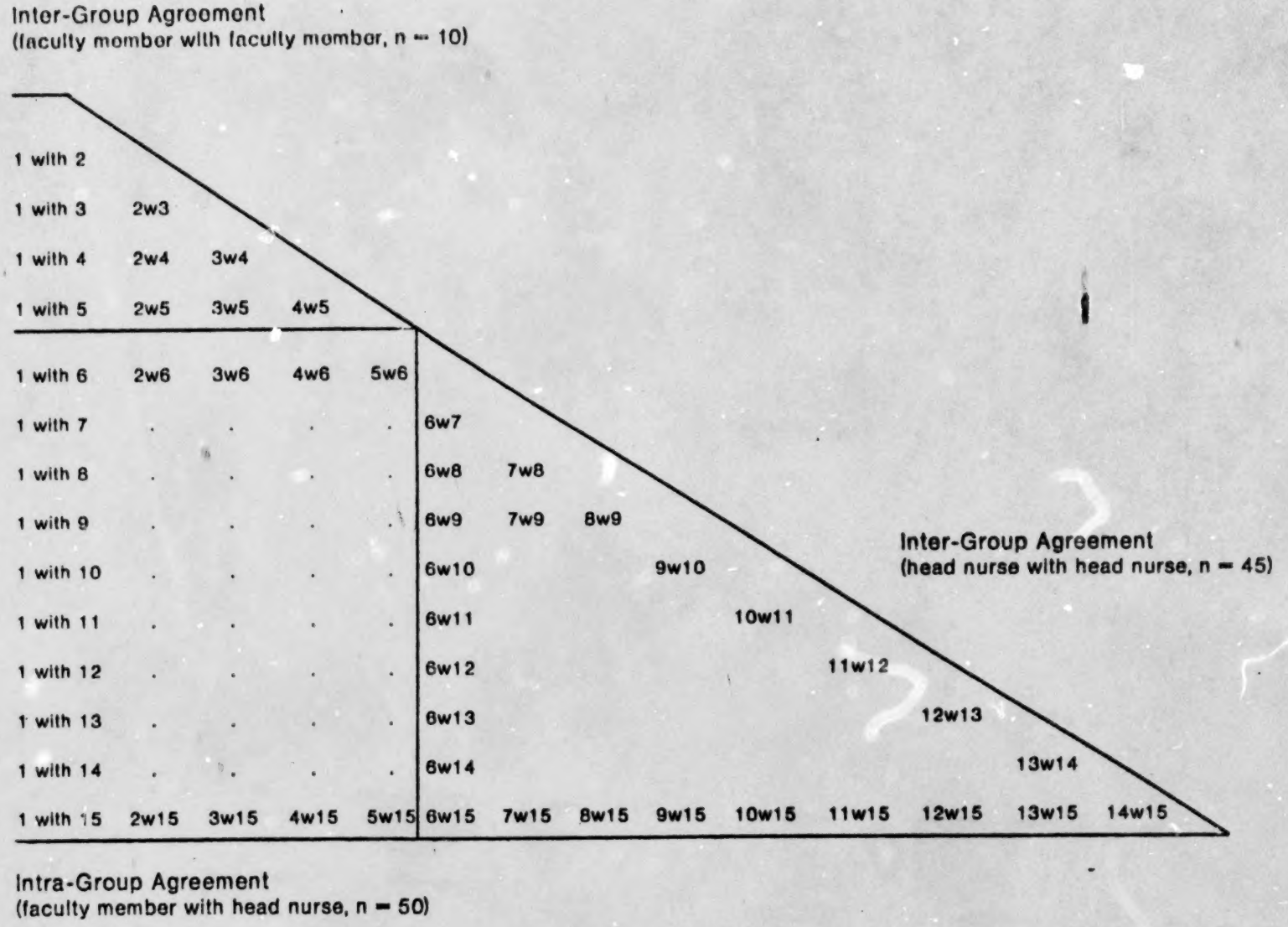
Inter-Group Agreement
(faculty member with faculty member, n = 10)
1 with 2
1 with 3 2w3
1 with 4 2w4 3w4
1 with 5 2w5 3w5 4w5
1 with 6 2w6 3w6 4w6 5w6
1 with 7 . . . . 6w7
1 with 8 . . . . 6w8 7w8
1 with 9 . . . . 6w9 7w9 8w9
1 with 10 . . . . 6w10 9w10
1 with 11 . . . . 6w11 10w11
1 with 12 . . . . 6w12 11w12
1 with 13 . . . . 6w13 12w13
1 with 14 . . . . 6w14 13w14
1 with 15 2w15 3w15 4w15 5w15 6w15 7w15 8w15 9w15 10w15 11w15 12w15 13w15 14w15
Inter-Group Agreement
(head nurse with head nurse, n = 45)
Intra-Group Agreement
(faculty member with head nurse, n = 50)

Figure 1

Sample Space Containing the Possible Combinations of Faculty and Head Nurses Associated with An ADN Program

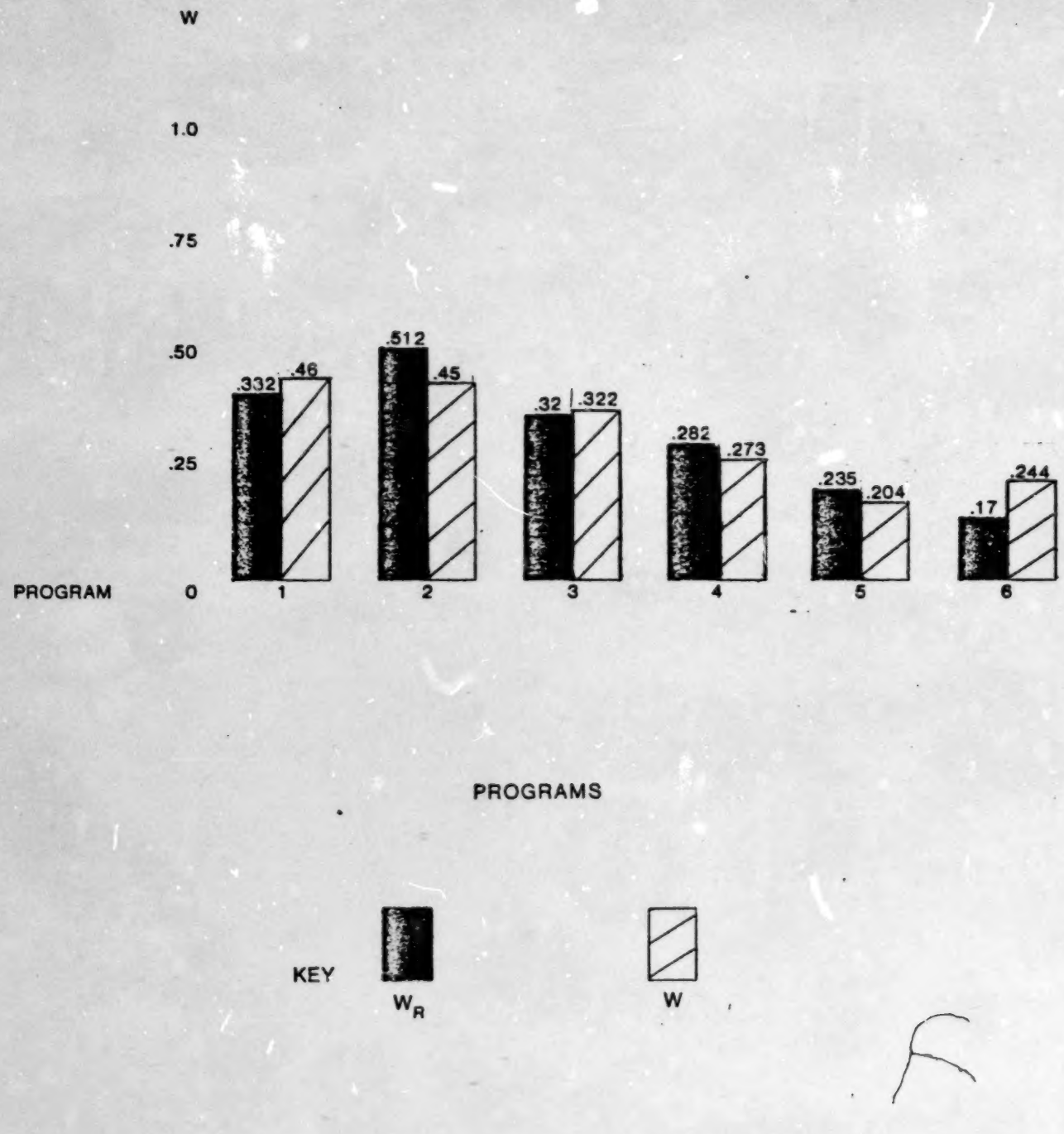

Figure 2
Comparison of W and W_R